

COLLABORATION FOR ENVIRONMENTAL EVIDENCE

SYSTEMATIC REVIEW No. 52

WORKING TITLE: DOES CONTACT WITH NATURE HAVE AN EFFECT ON PHYSIOLOGICAL OR PSYCHOLOGICAL STRESS?

CONSULTATION DRAFT REVIEW PROTOCOL

Lead Reviewer: *Dr Joelene Hughes*

Postal Address: *Wildlife Conservation Research Unit
University of Oxford
Tubney House
Abingdon Road
Tubney
Oxfordshire
OX13 5QL*

E-mail Address: *joelene.hughes@zoo.ox.ac.uk*

Telephone: *+44 (0)1865 393119*

Fax: *+44 (0) 1865 393101*

COVER SHEET

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Contact address	<i>Wildlife Conservation Research Unit University of Oxford Tubney House Abingdon Road Tubney Oxfordshire OX13 5QL</i> <i>joelene.hughes@zoo.ox.ac.uk</i>
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1. BACKGROUND

Mental health disorders related to stress, such as depression, are increasing across Europe and the rest of the globe (WHO 2005; Prince et al 2007). Concurrently, the human population is becoming increasingly urbanised and it is predicted that more than half the world's population will live in urban areas in 2008 (UN 2007). The proposition that spending time with 'nature' can reduce stress seems self evident to many people. Nature, as a recuperative tonic, has been advocated throughout recorded history from Grecian healing groves to Victorian seaside resorts.

Over the past few years, several organisations have emphasised afresh the potential benefits of interaction with nature for human mental and physical health (e.g. Pretty 2005, Bird 2007). Some are increasing resources investment in suitable areas in the hope of capitalising on these benefits (e.g. Green Gyms, BTCV 2008). For many organisations with limited budgets, this necessitates diverting resources from other areas. In order to best ensure the most appropriate use of resources, it is important to make the best use of the evidence available on interventions that may be incorporated into policy and practice.

Current knowledge on the health benefits of interaction with nature has been drawn from a wide variety of research. There are well-established theories about the restorative qualities of the natural environment (Ulrich 1991; Kaplan & Kaplan 1983) and a body of literature has been attached to these ideas, with some providing evidence that exposure to nature provides health benefits (Pretty et al 2005). However, although reviews of this literature have been carried out (see Bowler et al 2008), a large proportion appear to start with the opinion that interaction with nature is beneficial and present the supporting evidence rather than considering it objectively, as a hypothesis to be tested. Other reviews remain unfocussed without specifying or quantifying the type of health benefit acquired. It is therefore timely to explore knowledge of the relationship between nature and health through a systematic review of the interdisciplinary literature. Systematic reviews provide a focused and comprehensive method of collating and synthesizing the data available on the impact of an intervention on an outcome of interest. Furthermore, systematic reviews can be utilised to highlight evidence gaps.

In 2007 a NERC grant was awarded to the Wildlife Conservation Research Unit at the University of Oxford for the project 'Quantifying Biophilia'. The project's remit was to hold interdisciplinary workshops and, through these and other explorations, to examine the relationship between human health and nature, in particular using stress as an indicator of health. Due to the interdisciplinary and diverse sources of research in this field, we are under-taking a systematic review in order to collate the current evidence.

The relationship between human health and well-being, with the environment is potentially very complex. The CEBC is currently carrying out a systematic review one part of the relationship between nature and human health (see Systematic Review No. 40 Draft Protocol). Systematic Review 40 (SR40) is reviewing research on the benefits of contact with greenspace, specifically looking at the health influence of direct access to natural environments in comparison to other kinds of exposure such as viewing pictures.

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It is intended that the review being undertaken here will complement SR40 by posing a related question. Here we look at the effect of any kind of exposure to nature (inside or outside a built environment) on a more specific health indicator – measurements of stress. Whilst SR40 encompasses a wider range of outcomes – any measure of health and well-being – this review examines a wider range of interventions – any interaction with nature – but on a more specific outcome. In conjunction the two reviews will hopefully elucidate, and highlight gaps in, our current knowledge on how nature benefits human health.

2. OBJECTIVE OF THE REVIEW

2.1. Primary question

- How effective is interaction with nature, whether indoors or outdoors, in reducing stress?

2.2. Secondary question

- What physiological changes occur on exposure to nature?
- What are the psychological effects of exposure to nature?
- Are the effects observed associated with nature both *in situ* or *ex-situ*, or with abstract or synthetic representations of nature?

For this review ‘nature’ encompasses all non-human species, as well as landscape features created by natural processes (such as mountains, beaches or water bodies). Landscapes that may be considered man-made or built but contain nature (for example golf courses or parks) will be considered as nature because they are dominated by non-human species.

In situ experiences of nature are defined as when an individual is surrounded by nature, *ex-situ* is where nature is being observed remotely, e.g. though a window, or a feature of nature is out of a natural context e.g. plant in an office, pet. Synthetic nature is anything representing nature e.g. buildings designed to be similar to natural structures, plastic plants, videos of nature, pictures of nature; abstract nature is a product of nature e.g. furs, skins, carvings.

3. METHODS

3.1. Search strategy

The following selection of sources will be searched for relevant information:

3.1.1 Systematic Review 40 Library

SR40 has a wider scope than this current review and it is therefore anticipated that it will include a large portion of the relevant publications.

In the first instance a comparison will be made between the publications arising from the first three database searches described below and the database searches carried out for SR 40. If there is a high proportion of overlap (c. 95%) the excluded 5% sample will be examined for bias. The papers in the excluded 5% will be reviewed to

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determine whether they constitute particular class/classes of intervention (as agreed by 2 reviewers). If a matching quantity of similar papers are not being picked up in the overlapping 95% the 5% sample will be considered biased. If there is a bias, a refined search for publications in this smaller topic area will be conducted in all sources. If there is no bias, the SR40 library will be considered to provide a comprehensive sample of the publications on the subject area and the subsequent database searches will be deemed unnecessary.

3.1.2 *Databases*

Given a low overlap in the Systematic Review 40 search described above, a search will be conducted looking for the keywords in publication titles and abstracts of articles stored in the following databases:

- i. PubMed
- ii. ISI Web of Knowledge
- iii. Directory of Open Access Journals
- iv. ASSIA
- v. PsycINFO
- vi. CINAHL
- vii. National Library for Health.
- viii. Index to Thesis on-line (UK)

3.1.3 *Websites*

A search using the key words (given below) will be conducted in the following internet search engines.

- i. www.google.com
- ii. www.scholar.google.com
- iii. www.scirus.com

The first 50 hits will be reviewed for relevant documents (pdf, Word doc. or Excel spreadsheets) according to the inclusion criteria defined below.

3.2. **Keywords**

The following keywords will be used to search for relevant publications contained within databases. Publications will be required to have at least one stress and one environment word.

3.2.1 *Stress Words:*

health, “well-being”, “wellbeing”, “well being”, psychological, physiological, stress, “attention restoration”, “attention recovery”

3.2.2 *Environment Words*

park, parks, green, greenspace, greenspaces, "natural environment", “natural environments”, "open space", “open spaces”, garden, gardens, gardening , horticulture, horticultural , countryside, outdoor, outdoors, biodiversity, wood, woods, woodland, woodlands, allotment, allotments, forest, forests, wilderness, gardening , biodiversity, pet, pets, plant, plants, wildlife, fur, “natural product” “natural products”

3.3. Study inclusion criteria

The articles identified by the searches will be assessed for relevance based on the following inclusion criteria. All articles identified from the SR40 and database searches will be uploaded into an Endnote library. Articles from the website search will be uploaded into Endnote where possible; otherwise titles and URL's will be maintained in an Excel spreadsheet.

Initially all articles will be filtered based on their title. The remaining articles will then be assessed based on their abstract (or introduction if there is no abstract) and then full text.

A second reviewer will be asked to assess the relevance of a proportion of the articles found in the SR40, database and website searches against the inclusion criteria. The Kappa statistic measures the proportion of agreement between reviewers. If Kappa is below 0.6, the differences in inclusion will be discussed and criteria modified, with articles then filtered again based on the new criteria.

3.3.1 *Relevant subject(s):*

Human population(s) in More Developed Regions (as defined by UN 2008).

Over 52 % of the human populations in More Developed Regions have lived in urban areas since 1950. In comparison countries in Less Developed and Least Developed regions are not expected to become more than 50% urbanised until 2015 and 2040 respectively (UN 2008). Any research on stress-related psychological or physiological effects of separation from nature is therefore more likely to have been carried out in, and be more relevant to, the More Developed Regions.

3.3.2 *Types of intervention:*

The intervention is a human behaviour not a policy implementation. Interactions with nature have been categorised to occur in the following ways:

- Direct association within nature (e.g. sitting in a park, hill walking, gardening, wilderness expeditions).
- Remote association (viewing videos pictures, presence of pet, plant, sculpture, wearing natural items e.g. fur).
- Presence in environment excluding nature (effectively the converse intervention demonstrating the result of removing nature from one's environment).

3.3.3 *Types of comparator:*

The review will include studies that compare stress measurements in the presence and absence of nature, or between different categories, for example in situ and ex situ interventions.

3.3.4 *Types of outcome:*

Stress is an expansive term used to cover a wide range of psychological and physiological effects so a broad range of outcomes will be included. These are expected to be observed as:

- Changes in physiological measurements e.g. blood pressure, heart rate, hormonal levels.
- Alterations in psychological measures using validated scores e.g. the Zuckerman Inventory of Personal Reactions (ZIPERS) test. The validity of any test used will be verified by relevant experts from the Psychology Department at the University of Oxford.

3.3.5 *Types of study:*

No restrictions on source, date or language. Studies will only be included if there is a comparison between no nature and nature interaction.

3.3.6 *Potential reasons for heterogeneity:*

There are several potential sources of heterogeneity:

- Type of interaction with nature
- Type of physiological or psychological measurement taken to indicate subject's stress
- There may be a learned like or dislike component affecting an individual's reaction to nature. Consequently disparity in a subject's previous experience of nature may lead to heterogeneity in reaction towards the same experience.

3.4. **Study quality assessment**

Data will be extracted from both quantitative and qualitative studies. Both types of studies will be assessed on the methodology used with advice for assessment being sought from qualified experts within appropriate fields. Different criteria may therefore be necessary to assess the quality of quantitative and qualitative studies.

3.5. **Data extraction and synthesis**

Data will be extracted from both quantitative and qualitative studies where possible. The amount of data available will not be known until the end of the searches, so the method of synthesis will be developed at a later stage in the review. With only a small amount of data, tabulation of results and effect sizes may be all that is possible, if a large quantity of data is available a meta-analysis of the effect of exposure to nature on stress may be appropriate.

4. **POTENTIAL CONFLICTS OF INTEREST AND SOURCES OF SUPPORT**

This study is being carried out as part of the NERC funded project "Quantifying Biophilia".

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